LISTING OF CLAIMS:

This listing of claims will replace all prior versions and listings of claims in the above-referenced application. This listing is provided for the convenience of the Examiner only as no claims have been amended herein.

1. (Previously presented) An electromagnetic actuator, comprising:

(A) a stationary assembly that includes (1) a hollow stator yoke composed of a soft magnetic material and (2) two coils disposed coaxially and separately in a traveling direction of the actuator inside the hollow stator yoke; and

(B) a movable assembly disposed in a hollow space of the two coils to oppose thereto with a very small clearance that includes (1) a movable magnet unit and (2) a movable yoke unit, both units mounted on a single supporting shaft adjacently to each other in an axial direction of the supporting shaft,

wherein the movable assembly travels in the axial direction by an electromagnetic force generated with the coils by the interaction between a magnetic field generated by the movable magnet unit and a current flowing in the coils, wherein said movable magnet unit is disposed on said single supporting shaft so as to oppose said coils radially,

wherein the two coils are wound on respective separate bobbins made of a synthetic resin and having a substantially identical shape with each other, and the two bobbins with the respective coils wound thereon are disposed axially inside the stator yoke with a predetermined distance provided therebetween,

wherein a pair of flanges are provided at both axial end surfaces of the respective bobbins, and at least one of the flanges has a terminal block integrally formed with the flange, and

wherein an upper edge and a lower edge of the hollow stator yoke are provided with cuts for receiving the terminal block.

2. (Original) An electromagnetic actuator according to Claim 1, wherein the direction of the current passing through one of the two coils is opposite from the direction of the current passing through the other coil.

3. (Cancelled)

4. (Previously presented) An electromagnetic actuator according to Claim 1, wherein

the stator yoke of the stationary assembly is a hollow cylinder, the two coils are ring-shaped and wound on the respective cylindrical bobbins;

the movable assembly has a supporting shaft at the center thereof, the movable yoke unit is located such that the movable yoke unit and the two coils effect electromagnetic action on each other; and

a pair of flanges are provided at both axial end surfaces of the stator yoke, each flange having a bearing mechanism, the supporting shaft is retained by the bearing mechanisms so as to be movable in the axial direction.

5. (Previously presented) An electromagnetic actuator according to Claim 4, wherein the movable magnet unit of the movable assembly is formed of at least one columnar of hollow magnet axially magnetized with two opposite polarities, namely, north pole and south pole, and the movable yoke unit is constituted by a pair of soft magnetic members that have a substantially identical configuration with each other and are disposed to sandwich the movable magnet unit and to abut respectively against a north-pole end surface and a south-pole surface thereof.

6. (Previously presented) An electromagnetic actuator according to Claim 4, wherein the movable yoke unit of the movable assembly is constructed by one or more columnar or hollow soft magnetic members, the movable magnet unit is constructed by a pair of magnets that have a substantially identical configuration with each other, are disposed to sandwich the movable yoke unit and to abut against both axial end surfaces thereof and are magnetized so that the inward portion and the outward portion of one magnet are polarized oppositely from each other and that the outward portion of one magnet is polarized oppositely from the outward portion of the magnet.

7. (Cancelled)

8. (Previously presented) An electromagnetic actuator, comprising:

a stationary assembly that includes two coils disposed coaxially with each other inside a hollow stator yoke composed of a soft magnetic material; and

a movable assembly that includes a movable magnet unit and movable yoke unit both disposed inside the coils with a very small clearance therefrom and both attached to a single supporting shaft such that the movable assembly is movable in the axial direction of the supporting shaft;

wherein the movable assembly travels in the axial direction by the interaction between a magnetic field generated by the movable magnet unit and a current passing through the coils, and wherein the moveable magnet unit is disposed on said single supporting shaft so as to oppose said coils radially;

wherein the two coils are wound on respective separate bobbins made of a synthetic resin and having a substantially identical shape with each other, and the two bobbins with the respective coils wound thereon are disposed axially inside the stator yoke with a predetermined distance provided therebetween;

wherein the stator yoke of the stationary assembly is a hollow cylinder, the two coils are ring-shaped and wound on the respective cylindrical bobbins;

wherein the movable assembly has a supporting shaft at the center thereof, the movable yoke unit is located such that the movable yoke unit and the two coils effect electromagnetic action on each other; and

wherein a pair of flanges are provided at both axial end surfaces of the stator yoke, each flange having a bearing mechanism, the supporting shaft is retained by the bearing mechanisms so as to be movable in the axial direction;

wherein the movable yoke unit of the movable assembly is constructed by one or more columnar or hollow soft magnetic members, the movable magnet unit is constructed by a pair of magnets that have a substantially identical configuration with each other, are disposed to sandwich the movable yoke unit and to abut against both axial end surfaces thereof and are magnetized so that the inward portion and the outward portion of one magnet are polarized oppositely from each other and that the outward portion of one magnet is polarized oppositely from the outward portion of the magnet; and

wherein the outer diameter of the movable yoke unit of the movable assembly is set to be smaller than the outer diameter of the movable magnet unit.

9. (Previously presented) An electromagnetic actuator according to Claim 8, wherein the travel distance of the movable assembly in the axial direction is set to 1.0 mm or less.

Claims 10 - 14 (Cancelled)

15. (Previously presented) An electromagnetic actuator according to Claim 1, wherein

the stator yoke of the stationary assembly is a hollow cylinder, the two coils are ring-shaped and wound on the respective cylindrical bobbins;

the movable assembly has a supporting shaft at the center thereof, the movable yoke unit is located such that the movable yoke unit and the two coils effect electromagnetic action on each other; and

a pair of flanges are provided at both axial end surfaces of the stator yoke, each flange having a bearing mechanism, the supporting shaft is retained by the bearing mechanisms so as to be movable in the axial direction.

16. (Previously presented) An electromagnetic actuator according to Claim 1, wherein the movable magnet unit of the movable assembly is formed of at least one columnar or hollow magnet axially magnetized with two opposite polarities, namely, north pole and south pole, and the movable yoke unit is constituted by a pair of soft magnetic members that have a substantially identical configuration with each other and are disposed to sandwich the movable magnet unit and to abut respectively against a north-pole end surface and a south-pole surface thereof.

17. (Previously presented) An electromagnetic actuator, comprising:

a stationary assembly that includes two coils disposed coaxially with each other inside a hollow stator yoke composed of a soft magnetic material; and

a movable assembly that includes a movable magnet unit and movable yoke unit both disposed inside the coils with a very small clearance therefrom and both attached to a single supporting shaft such that the movable assembly is movable in the axial direction of the supporting shaft,

wherein the movable assembly travels in the axial direction by an electromagnetic force generated with the coils by the interaction between a magnetic field generated by the movable magnet unit and a current passing through the coils, and wherein the moveable magnet unit is disposed on said single supporting shaft so as to oppose said coils radially,

wherein the movable magnet unit of the movable assembly is formed of a plurality of columnar magnets axially magnetized with two opposite polarities, namely, north pole and south pole, and the movable yoke unit is constituted by a pair of soft magnetic members that have a substantially identical configuration with each other and are disposed to sandwich the movable magnet unit and to abut respectively against a north-pole end surface and a south-pole surface thereof, and

wherein the outer diameter of the movable magnet unit of the movable assembly is set to be smaller than the outer diameter of the movable yoke unit.

18. (Previously presented) An electromagnetic actuator, comprising:

(A) a stationary assembly that includes (1) a hollow stator yoke composed of a soft magnetic material and (2) two coils disposed coaxially and separately in a traveling direction of the actuator inside the hollow stator yoke; and

(B) a movable assembly disposed in a hollow space of the two coils to oppose thereto with a very small clearance that includes (1) a movable magnet unit and (2) a movable yoke unit, both units mounted on a supporting shaft adjacently to each other in an axial direction of the supporting shaft,

wherein the movable assembly travels in the axial direction by the interaction between a magnetic field generated by the movable magnet unit and a current flowing in the coils, and

wherein the movable yoke unit of the movable assembly is constructed by one or more columnar or hollow soft magnetic members, the movable magnet unit is constructed by a pair of magnets that have a substantially identical configuration with each other, are disposed to sandwich the movable yoke unit and to abut against both axial end surfaces thereof and are magnetized so that the inward portion and the outward portion of one magnet are polarized oppositely from each other and that the outward portion of one magnet is polarized oppositely from the outward portion of the magnet.

19. (Previously presented) An electromagnetic actuator according to Claim 18, wherein the outer diameter of the movable yoke unit of the movable assembly is set to be smaller than the outer diameter of the movable magnet unit.

20. (Previously presented) An electromagnetic actuator according to Claim 18, wherein the travel distance of the movable assembly in the axial direction is set to 1.0 mm or less.

21. (Cancelled)

22. (Previously presented) The electromagnetic actuator of claim 1, wherein said movable magnet unit is disposed to sandwich said movable yoke unit.

23. (Previously presented) An electromagnetic actuator, comprising:

(A) a stationary assembly that includes (1) a hollow stator yoke composed of a soft magnetic material and (2) two coils disposed coaxially and separately in a traveling direction of the actuator inside the hollow stator yoke; and

(B) a movable assembly disposed in a hollow space of the two coils to oppose thereto with a very small clearance that includes (1) a movable magnet unit and (2) a movable yoke unit, both units mounted on a single supporting shaft adjacently to each other in an axial direction of the supporting shaft,

wherein the movable assembly travels in the axial direction by an electromagnetic force generated with the coils by the interaction between a magnetic field generated by the movable magnet unit and a current flowing in the coils, wherein said movable magnet unit is disposed on said single supporting shaft so as to oppose said coils radially, and wherein the movable magnet unit is disposed to sandwich the movable yoke unit.